A PROBATIONARY SURGICAL ESSAY ON ANEURISM, AND PARTICULARLY ON POPLITEAL ANEURISM.

SUBMITTED,
BY AUTHORITY OF THE PRESIDENT AND HIS COUNCIL,
TO THE EXAMINATION OF THE
Royal College of Surgeons of Edinburgh,
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FOR ADMISSION INTO THEIR CORPORATION,
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OF
ORDINARY MEMBERS:

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TO

THOMAS BLIZARD, Esq. F. R. S.

SURGEON TO THE LONDON HOSPITAL,

AS A SMALL TRIBUTE OF GRATITUDE AND ESTEEM

FROM HIS HIGHLY OBLIGED

AND TRULY GRATEFUL FRIEND,

A. M'D. ROSS.

ESSAY

POPLITEAL ANEURISM.

Aneurism is a disease highly interesting to the Surgeon, as much from the frequency of its occurrence, as from its generally fatal termination, where a chirurgical operation is not performed in due time, or where it is inadmissible.

As the subject of Aneurism in general is too extensive to be treated of in an Inaugural Essay, I purpose to confine myself in a great measure to one species of the disease, the *popliteal aneurism*, and only to offer such remarks on this subject as apply strictly to it, although they may also be applicable to aneurism in general.

Popliteal aneurism becomes particularly important, as it occurs more frequently than any other kind of external aneurism, and as, under ordinary circumstances, it may generally be cured by a surgical operation.

It is proposed in this Essay, in the first place, to make a few general observations on the structure of the artery: 2. To describe the usual symptoms of popliteal aneurism: 3. To enumerate the particular varieties, with their peculiar characteristics; and lastly, to speak of the treatment of the disease.

I.

OF THE STRUCTURE OF THE ARTERY.

A very few observations on the structure of the artery will suffice for our present purpose. Arteries are elastic tubes through which the blood, projected from the heart, is impelled to the most remote parts of the body. They possess four coats, endowed with peculiar properties, three of these coats proper to the artery, the other common to it, with most parts of the animal frame.

The *external coat* differs in no respect from the common cellular membrane, and is interesting at present chiefly from this circumstance, that it most commonly forms the sac of the encysted false aneurism.

The *second* is the membranous or tendinous coat, and constitutes the chief strength of the artery. This coat is white, dense, and highly elastic, and is composed of fibres running in various directions.

The *third coat*, or the *tissûe arteriel* of Bichât, is composed of membranous strata of circular fibres; its structure is very delicate, and easily torn or ruptured.

The *internal coat* is dense, elastic, shining, and polished, much resembling, in many of its properties, the class of serous membranes. It is, moreover, easily torn, as may be proved by applying a ligature moderately tight on a portion of artery; on removing the ligature, and slitting up the artery, the internal and third coats will be found divided through their whole circumference. This was first pointed out to surgeons by Dessault, and afterwards established by the experiments of Drs Thomson and Jones.

In addition to these, the arteries receive coverings in the different cavities, from the membranes peculiar to these; for example, they have in the abdomen a covering from the peritoneum, and from the pleura in the thorax.

II.

OF POPLITEAL ANEURISM IN GENERAL.

Popliteal Aneurism, in common with other aneurisms, gives rise to a train of highly distressing symptoms, which would sooner or later prove fatal, unless they were prevented by the timely intervention of Surgery, or by a natural cure taking place, which is very rarely met with in this kind of the disease.

Aneurism is often insidious in its commencement, in as much as it has frequently made considerable progress before its existence is suspected. The attention of the patient is often first roused to it by a feeling of uneasiness, or weakness, accompanied with swelling in one leg. He attributes these symptoms to some accidental circumstance; nothing is done. The continuance, or rather increase of these, at length leads to a particular examination, on which there is frequently found a small pulsating tumor in the ham. In other cases, the origin of the disease is dated from the reception of a blow or sprain in the ham, which is, sooner or later, followed by a tumor, similar to that just mentioned. The tumor soon afterwards becomes distinctly formed, and before it has attained a large size, it presents the following characteristic marks. When gently pressed, it gives a distinct, sometimes a very strong sense of pulsation; if more strongly compressed, it often disappears altogether. Compression in the course of the femoral artery is also frequently followed by a considerable diminution in the tumor. To the touch, it is soft and equable. In this stage of the disease, the swelling of the limb is neither very considerable, nor are the symptoms of constitutional derangement strongly marked. When, however, the disease has existed for a length of time, we find a train of highly distressing symptoms. The tumor in the ham, which has been described as a small, soft, and throbbing swelling, gradually increases in size; becomes less equal to the touch; instead of being soft, as formerly, it acquires in some parts a hardness and irregularity; it does not wholly disappear on pressure; the pulsation, at first strong, and distinct, becomes gradually less so, till at length it can with difficulty be distinguished. The limb, at first affected with an inconsiderable degree of swelling and weakness, when the tumor has attained considerable magnitude, becomes much swollen, benumbed, œdematous, and frequent shooting pain darts through it. Such an affection cannot be supposed to exist, without exciting much general derangement of the system; we accordingly find it accompanied by general uneasiness, restlessness, anxiety, loss of appetite, emaciation, disorder of the digestive organs; in short, with all the symptoms of fever from irritation. The integuments covering the tumor for a long time retain their natural appearance; when, however, the bulk of the tumor becomes great, they change from their natural to a leaden colour, and at its most prominent point a low degree of inflammation comes on, terminating in a slough or ulceration. When the dead part is completely separated from the living, or when the ulceration is completed, an hæmorrhage, generally fatal, is produced by some sudden emotion of mind or exertion of body *.

I have above attempted, in as few words as possible, to give a general history of popliteal

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* See history of a case of popliteal aneurism terminating fatally, in Scarpa, p. 118.

aneurism; but the disease is so much modified by the proximate cause, as to render it impossible to give such a general description of it, as may be applicable to every individual case. To combat this difficulty, it will be necessary to proceed to an account of the different varieties of popliteal aneurism.

III.

OF THE DIFFERENT VARIETIES OF POPLITEAL ANEURISM.

Although Scarpa * has denied the possibility of the existence of *true popliteal* aneurism, yet, as the greater number of surgeons and anatomists make use of this term, perhaps I may be excused for assuming the division into *true* and *false* aneurism.

1. By the term *true* aneurism is meant, a tumor arising in the course of an artery from an equal dilatation of the arterial coats.

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* Scarpa on Aneurism, chap. vi.

The preceding general description of the phenomena attendant on the presence of popliteal aneurism, approaches more nearly to that of *true*, than of any other species of aneurism. It will be proper, however, again to mention the more striking features of this variety. The *true popliteal* aneurism is slow in its progress; the tumor formed in the ham is small, of an oval figure, strongly pulsating, and may be made almost entirely to disappear on pressure; the limb of the affected side is little changed, and few symptoms of constitutional derangement are evident. When the tumor increases much in size, and becomes hard and irregular on its surface, there is much reason to suspect that the disease has changed from the *true* to the *false popliteal aneurism.* This may be either the consequence of violence done the aneurismal tumor, or may arise from the gradual destruction of the sac.

2. *False aneurisms* have been divided into the *encysted*, the *mixed*, and the *diffuse* aneurisms. These shall be mentioned in order:

And, first, of the *encysted false aneurism.* This variety of popliteal aneurism pursues a more rapid, and a considerably different course from *true aneurism.* When first observed, the tumor in the ham, if small, will be found to want the regularly oval figure of the *true* aneurism; and although it be soft to the touch, and disappear on pressure at its commencement, it soon loses these marks, which belong more particularly to *true aneurism.* Soon after its appearance, the tumor becomes irregular in shape, hard, and unequal in its surface; its pulsation, at first strong and distinct, becomes gradually more feeble, and at length almost wholly disappears; the limb is affected with œdematous swelling, numbness, and shooting pain.

The disease, unaided by art, generally terminates fatally, after running a course similar to that above described, by the sloughing or ulceration of the integuments, and the hæmorrhage which consequently supervenes. On examining an *encysted false aneurism*, the proper coats of the artery are found to be destroyed at some point, and the sac is formed by the cellular membrane which envelopes the artery.

2. With regard to the *mixed* aneurism, which is the second species of false aneurism, it is only necessary to remark, that by this term is meant to be expressed that variety of the disease, which, having commenced as *true aneurism*, has, from the gradual or sudden destruction of the proper coats of the artery, been changed into the *false.* When the *true* aneurism becomes very large, hard, and unequal on its surface, with pulsation much diminished, there is great reason to imagine that the change above alluded to has taken place.

If a blow or other injury is received on the *true aneurismal* tumor, or *encysted false aneurism*, and an extensive swelling is immediately produced, we have then before us an instance of the last variety of false aneurism, the *diffuse.*

3. *Diffuse* aneurism, from the rapidity of its accession, and generally immense size, is much more formidable in appearance than any other

species of aneurism. The causes giving rise to this and to the other varieties shall be afterwards mentioned; but I must here observe, that, from whatever source it has originated, an extensive diffused swelling of the limb affected, in the vicinity of the wounded or ruptured artery, immediately takes place. If the popliteal artery has suffered, the swelling embraces the ham and lower part of the thigh, extending up between the flexor muscles, and, encroaching on the leg, distends the gastrocnemii muscles; the blood occasionally makes its way to the surface, giving a livid tint to the integuments; at other times insinuating itself among the deep muscles, it is extravasated around the bone for some extent. The swelling having obtained a great size, becomes at last stationary; new appearances begin to shew themselves; the tumefaction gradually loses its tense and hard feel, becoming soft, and giving, in some places, a sense of fluctuation; sloughing, or ulceration, attacks some part of the surface; and, when an opening is formed, a copious discharge of bloody and fetid matter ensues, which is soon followed, in the majority of cases, by a flow of arterial blood. These swellings have occasionally, under the impression of their being common abscesses, been punctured.

IV.

CAUSES OF ANEURISM.

This part of the subject, it will be generally admitted, is involved in much obscurity. For *true aneurism*, few or no *remote causes* have been assigned. As a remote cause of this species, however, may be mentioned, exposure of part of an artery from its natural situation, to a more than ordinary impetus of the current of blood—as, for example, at the arch of the aorta. The popliteal artery is also in an exposed situation at the bend of the knee, more especially in those who have occasion to make use of the gastrocnemii muscles more than usual; as coachmen, postillions, and the like *. As *ex-*

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* Paper on Aneurism in the Lond. Med. Trans. by E. Home, p. 142.

citing causes of true aneurism, may be enumerated, blows or bruises on the artery, tending to weaken without lacerating its coats, and, as Mr B. Bell has suggested, a removal of the surrounding parts by suppuration, or in any other manner * : to these may be added specific and diseased action in the coats of the artery. The *proximate cause* of true aneurism is, debility of the muscular and elastic powers of the artery, admitting of a greater than natural dilatation of its tube.

The *exciting causes* of false aneurism are various ; the following more particularly claim our attention : Specific disease in the internal coats of an artery, terminating in ulceration† ; laceration from external violence, or a sudden and violent exertion ; punctured wounds of the artery, producing either the encysted, or what is more probable, the diffuse aneurism : These may be inflicted, either by a pointed weapon, or the spicula of a fractured bone. The *proximate cause* of false aneurism is a destruction of some of the arterial coats. The system being tainted with syphilis has been assigned as a *remote* or *predisposing* cause of aneurism, which opinion is in some measure confirmed, by finding, in the details of cases, that many patients bore marks of this disease.

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* Bell's Surgery, p. 174, 175.

† Scarpa, p. 125.

Before considering the *treatment* of popliteal aneurism, it appears necessary to premise a few observations on the circumstances that should deter us from operating. It is very obvious, that, where the patient's strength is so much exhausted as to threaten speedy dissolution, no prudent practitioner would advise an operation, but would rather employ such palliative means as may alleviate the sufferings of his patient. Neither ought a surgeon to recommend an operation, where it is known that an internal aneurism exists along with the external one. For our object being by an operation to bring about a radical cure, this cannot be obtained, while a more formidable disease exists beyond our reach. But the question whether we ought to operate, when there are two aneurisms existing, both within our reach, is more difficult of solution. That this has been done successfully, is true *, but one or two detached cases can surely never establish a rule for our general practice. The most forcible objection to operating, in this case, is the probable recurrence of the disease in some other artery, from the strong constitutional predisposition to it, indicated by its appearance in two distinct situations. This disposition to the formation of aneurism, is, in some cases, very strongly marked. Mr A. Cooper found, on inspecting the body of a patient, who had died of this disease, seven distinct aneurisms †. In another instance, of a man on whom I had an opportunity of seeing the operation for subclavian aneurism performed by Sir William and Mr Thomas Blizard, on examination after death, the subclavian and carotid arteries of the other side were found to be affected with incipient aneurisms. Many cases might be brought forward to substantiate this fact, but these will suffice.

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* Case by Mr Home, in the Lond. Med. Trans. p. 235—44.

† Mr Cooper's Lectures.

When two external aneurisms exist in the same person, I would be inclined to give a fair trial to such means as have been known to prove serviceable in retarding the progress of aneurism; or, should these fail, I would wait a reasonable time to see how far it is likely that a natural cure may be effected. During the period thus occupied, I would carefully watch the variations of the disease, and the circumstances of the patient's constitution, and should the tumor increase rapidly, or symptoms of great constitutional derangement seem to take place, I would then recommend the operation to be performed on both tumors, at proper intervals.

If the patient will not submit to an operation, when every circumstance has been fairly stated to him, or should the surgeon be satisfied, that there is no room for operating, his attention must be turned towards arresting or alleviating the progress of the disease.

The means to be employed must be regulated by the circumstances of every individual case. I shall only observe here, that they chiefly consist in enjoining rest of body, keeping the patient's mind as quiet as possible, his bowels moderately open, allowing him only a light diet, without wine or other strong liquor,—in short, observing strictly the antiphlogistic regimen; not that the disease is of an inflammatory nature, but because a similar regimen is useful in aneurism as well as in inflammation. From the nature of this affection, it is evident that no local remedies, farther than urgent symptoms may render necessary, are to be used. Should the surface of the tumor become inflamed or excoriated, any cooling solution of acetite of lead or sulphate of zinc may be employed; but here some degree of caution is necessary; for if the limb is cold, and appears to have lost in a considerable degree its vitality, we might perhaps in this way bring on mortification, and thus accelerate the event we are striving to keep off. This objection may be got the better of, by using some cooling cerate, as the ointment of acetite of lead, or Goulard's cerate.

Spontaneous cures of aneurism do now and then occur, so that if the efforts of nature be aided by attention to the before-stated rules, we may entertain some faint hopes of the patient's recovery.

It may be mentioned, that blood-letting has been frequently employed, and of late successfully, in the cure more particularly of internal aneurisms, by a French practitioner,Le Pelletan. Several cases of complete recovery are narrated by this author, who draws strong and decided conclusions from his practice *. I am inclined to think, however, that this practice will never be received into general use, even in internal aneurisms. There are few men who would venture on bleeding a patient, to the point from which the animal powers may probably be unable to restore him. Le Pelletan seems to think, that the languor in the circulation, produced by the bleeding, permits the coagulation of the blood in the aneurismal sac, and thus a radical cure is effected. Along with copious and fre-

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* Clinique Chirurg. par Le Pelletan, tom. i. p. 94, 95.

quent bleedings, the most rigid antiphlogistic regimen, and the local application of ice are employed.

V.

OF THE OPERATION OF POPLITEAL ANEURISM.

Before Mr Hunter's operation was made known, two plans of procedure were followed in this country. One of these was to cut upon the tumor, and secure the artery at the upper and under extremities of the aneurismal sac: The other, and I believe the more common, was to amputate the limb. The latter was practised in consequence of the surgeon being convinced, that either the former operation proved frequently fatal, or that he probably would ultimately be obliged to remove the extremity, after an unsuccessful attempt to save it. The objections to the first of these methods, which forcibly struck Mr Hunter, and I may perhaps say, surgeons in general, were, first, the difficulty of getting at the artery, from the great depth of parts, rendering the operation very painful to the patient, and embarrassing to the surgeon: Secondly, the great exposure of parts in a diseased state, giving rise to extensive ulceration, and frequently sloughing, which often carried off the unfortunate patient, already much exhausted by the long continuance of a distressing and painful complaint: And lastly, from the artery being often so much diseased for some distance above the aneurismal sac, that no union took place between its sides, and on the separation of the ligature, a fatal secondary hæmorrhage frequently took place. Such formidable objections accounted for surgeons preferring amputation, and induced Mr Hunter to turn his mind towards devising a mode of operating, that might disarm the operation for popliteal aneurism of the greater part of the risk attending it, and, in the greater number of cases, save the patient's limb. It is not for me to attempt any eulogium on Mr Hunter's merits; these are already too well established for any detraction to injure, or any panegyric to increase. I will only observe, that his endeavours were crowned with success, and he led the way to an operation, which, with some improvements made by other surgeons, is exclusively employed at this day. Among its numerous advantages, I may observe, that it is much more easily performed than the old operation. No preparation is necessary. The same treatment ought to be pursued in cases where we intend operating, as was mentioned in the palliative or medical practice in aneurism.

Mr Hunter's operation was performed in the following manner *: An incision, from two to three inches in length, was made about the middle of the thigh, or rather higher, through the common integuments, parallel with the sartorius muscle. This muscle was carefully laid bare towards its inner margin. When this was accomplished, the artery enclosed in its sheath, and embedded in cellular substance, along with the accompanying vein, was brought into view. The operator now divided the sheath, and with

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* See the full account of Mr Hunter's operation, in the Lond. Med. Trans. Vol. I. p. 138 to 182.

his fingers, or the handle of his knife, separated the artery for some distance from the other vessel. He then introduced the aneurism needle, armed with two threads, under the artery ; then withdrawing the needle, he secured the vessel with both ligatures, tied at some distance from each other. The wound was then closed with adhesive plaster, the proper compress and bandage applied, and the patient put to bed. In the first case on which Mr Hunter operated, he employed four ligatures, but finding that they rather retarded the cure, and were quite unnecessary, he, in his subsequent operations, used but two.

Mr Hunter's operation, although infinitely superior to the former, had still some disadvantages. It was frequently found, that, instead of the *adhesive*, the internal coats of the artery took on the *ulcerative* inflammation, accompanied by penetrating sinuses in the course of the artery ; thus the cure was either much retarded, or the patient, as happened in some cases, was destroyed by secondary hæmorrhage. Mr Abernethy, conceiving that this was produced by the tension resulting from the tying of the artery, proposed, and it was done at his suggestion, in Bartholomew's hospital, to divide the artery between the ligatures ; the result proved the propriety of his advice *. With this improvement the Hunterian operation is practised at this time, and with the happiest result in the majority of cases. Mr H. Cline has proposed passing a ligature through the upper extremity of the artery, with a view to enable us to pull the retracted artery down, in the event of the ligature coming away too soon. I should conceive this expedient unnecessary in the operation for popliteal aneurism ; but when the external iliac, or any other large artery is tied, it may possibly be done with advantage.

In some cases where this operation has been performed, hæmorrhage has taken place from the ligature being pushed off by the pulsation from the orifice of the artery.

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* Abernethy's Surgical Observations, p. 156.

This may arise from the ligature of the artery being completed before the vessel is divided. But the danger, I conceive, arising from this accident, may be obviated, by tying only one knot of the upper ligature, and while the assistant keeps the ligature firm, the surgeon divides the artery, and the assistant now finishes the tying as in ordinary cases. Now, as there seems little or no difference between a ligature applied to an artery in this situation, and to one after amputation of the limb, and as the ligature rarely slips off in the last mentioned case, I see no reason why it ought not to succeed equally well in the former.

After the operation for popliteal aneurism has been performed, the edges of the wound are to be drawn together, and covered with adhesive plaster; the limb is to be wrapped in warm flannel, or lamb's wool, and the patient put to bed. The general treatment is to be such as has been before mentioned. If the limb becomes cold, friction with the heated hand may be employed, or bottles, filled with warm water, applied to the foot and leg. Mr A. Cooper narrates a case in his Chirurgical Lectures, where impending mortification disappeared, under continued and careful rubbing with the hands. The bad effects of cold are proved by a case also narrated by Mr Cooper in the London Medico-Chirurgical Transactions*. After the operation for popliteal aneurism, the limb becomes colder than the other; this gradually disappears, and the day following the operation, in the majority of cases, it is found by the thermometer to be of a greater temperature. The wound made in this operation often heals by the first intention, except at the openings through which the ligatures are brought out; these coming away from the 15th to the 18th day, the cure is generally completed about this time.

From the time of the operation, the tumor is checked in its growth, and then begins gradually to diminish, till at length it almost wholly disappears. The process of absorption is more or less rapid in different instances: this depends in great measure on the size the tumor had attained previous to the operation.

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* Lond. Medico-Chirurg. Trans. p. 252.

In some cases, abscesses form in the situation of the tumor, either with or without sloughing; these, when opened, yield a copious and fetid discharge, which, if long continued, may perhaps defeat our efforts, and destroy the patient. During this process, patients must be supported by the proper tonics, and nourishing diet.

It sometimes happens that, in apparently favourable cases, mortification of the limb supervenes to the operation. If the patient survives the separation of the dead from the living parts, amputation becomes our only resource.

If secondary hæmorrhage should unfortunately occur, even although the operation has been properly performed, we must then secure the artery at some distance above the place where the ligature was formerly applied; and we are much indebted to Mr Abernethy, who first pointed out, and proved the practicability of securing the external iliac artery above Poupart's ligament*.

When the femoral artery has been tied at the middle of the thigh, the circulation is carried on in the limb by means of the anastomoses between the branches of the profunda femoris, and those given off by the popliteal artery below the aneurismal tumor†. It has been advanced as an argument for operating early, by a late author, that these collateral branches do not enlarge till after the operation has been performed ‡. The circulation is soon carried on almost as well as before the operation, and the limb regains its wonted strength and vigour.

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[*] Abernethy's Surg. Obs. p. 162-3-4.

[†] I have seen an exception to this, where, in consequence of the artery having been tied as low down as practicable, the anastomosing branches were supplied by the part of the superficial femoral artery, which remained betwixt the division of the common femoral into the deep and superficial branches, and the point where the ligature had been applied. This points out to Surgeons the propriety of tying the artery as far down as possible, before it perforates the tendon of the triceps adductor muscle.

[‡] Ramsden's Prac. Obs. p. 296. Note.

FINIS.

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